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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/599,418	09/28/2006	Zhongmin Steve Lin	PHUS040183US3	6123

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PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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EXAMINER	
SANEI, MONA M	
ART UNIT	PAPER NUMBER
2882	
MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/599,418	LIN, ZHONGMIN STEVE	
	Examiner	Art Unit	
	MONA M. SANEI	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 16-20* is/are rejected.

7)☒ Claim(s) *13-15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/28/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informality: on page 8, line 9, there should be a period between "milliseconds However".

Appropriate correction is required.

Claim Objections

2. Claims 1-4 and 13-15 are objected to because of the following informalities:

- In claim 1, line 5, "axial position" should read - -axial position of the x-ray source- -.
- In claim 13, line 3, "associated imaging" should read - -associated imaging subject- -.
- In claim 14, line 15, "the a total x-ray current" should read - -a total x-ray current- -.
- Claims 2-4 and 15 are objected to by virtue of their dependencies.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Dafni (US 6198789).

Regarding claim 1, Dafni teaches a method of CT imaging (col. 1, lines 9-10) in which an x-ray source (28) rotates around a subject (22), which subject is moved axially relative to the rotating x-ray source during an imaging scan (col. 3, lines 50-51; col. 9, line 43) characterized by

modulating a level of radiation (col. 2, lines 47-49) produced by the x-ray sources in accordance with both angular position of the x-ray source around the subject and axial position along the subject (col. 3, line 50-col. 4, line 8; col. 9, line 39-65).

Regarding claim 2, Dafni teaches the level of radiation being modulated in accordance with radiation attenuation measured in a preceding revolution of the same imaging scan (col. 3, lines 59-61).

Regarding claim 3, Dafni teaches the level of radiation being modulated in accordance with radiation attenuation measured N(180°) preceding, where N is an integer (col. 4, lines 1-3).

Regarding claim 4, Dafni teaches a processor (46) programmed to perform the method according to claim 1.

4. Claims 5-9 and 17-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Kalender et al. (Dose reduction in CT by anatomically adapted tube current modulation. II. Phantom measurements; 1999; Medical Physics; 26(11)).

Regarding claim 5, Kalender et al. teaches a method of dose modulation in CT imaging (pg. 2248, col. 1, paragraphs 1-2) comprising acquiring transmission tomographic imaging data (pg. 2248, col. 2, lines 10-12) of an associated imaging subject (pg. 2248, col. 1, paragraph 3) using a radiation source (pg. 2248, col. 1, line 7) revolving (pg. 2248, col. 2, line 14) around the associated imaging subject, during the tomographic imaging, determining an estimated attenuation of radiation for an upcoming position or angular bin of the revolving radiation source based on attenuations measured at previous positions or angular bins of the radiation source (pg. 2248, col. 1, paragraph 2; pg. 2248, col. 2), and prior to acquiring tomographic imaging data at the upcoming position or angular bin, adjusting a level of radiation produced by the radiation

source based on the estimated attenuation of radiation (pg. 2248, col. 1, lines 14-15; pg. 2248, col. 2, lines 20-22).

Regarding claim 6, Kalender et al. teaches estimating the attenuation based on attenuations measured for a previously acquired position or angular bin in which the radiation source was about an integer multiple of a half-revolution away from the upcoming position or angular bin (pg. 2248, col. 2, lines 17-20).

Regarding claim 7, Kalender et al. teaches relatively moving the associated imaging subject and the radiation source in a longitudinal direction generally transverse to a plane of revolution of the radiation source such that the radiation source follows a generally helical trajectory respective to the associated imaging subject (pg. 2248, col. 2, lines 18-20).

Regarding claim 8, Kalender et al. teaches that the radiation source is an x-ray tube (pg. 2248, col. 1, line 7), and the adjusting of a level of radiation includes adjusting an x-ray current of the x-ray tube (pg. 2248, col. 1, lines 13-15).

Regarding claim 9, Kalender et al. teaches limiting the adjusting to a range defined by a minimum current value and a maximum current value (pg. 2248, col. 2, lines 15-17).

Regarding claim 17, Kalender et al. teaches a dose modulation processor (see "current modulation unit" in figure 1) for performing the dose modulation method set forth in claim 5.

Regarding claim 18, Kalender et al. teaches a dose modulated tomographic apparatus (pg. 2248, col. 1, paragraphs 1-2) comprising a tomographic scanner for acquiring transmission tomographic imaging data (pg. 2248, col. 2, lines 10-12) of an associated imaging subject (pg. 2248, col. 1, paragraph 3), the tomographic scanner including a radiation source (pg. 2248, col. 1, line 7) revolving around the associated imaging subject (pg. 2248, col. 2, line 14), a means for

determining an estimated attenuation of radiation for an upcoming position or angular bin of the revolving radiation source based on attenuations measured at previous positions or angular bins of the radiation source (pg. 2248, col. 1, paragraph 2; pg. 2248, col. 2), and a means for adjusting a level of radiation produced by the radiation source based on the estimated attenuation of radiation (pg. 2248, col. 1, lines 14-15; pg. 2248, col. 2, lines 20-22).

Regarding claim 19, Kalender et al. teaches a means for determining a characteristic radiation attenuation for tomographic imaging data acquired over a previous revolution of the radiation source (pg. 2248, col. 2, lines 17-24).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 10-12 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalender et al. as applied to claim 8 above, and further in view of Gies et al. (Dose reduction in CT by anatomically adapted tube current modulation. I. Simulation studies; 1999; Medical Physics; 26(11)).

Regarding claims 10-12, Kalender et al. teaches a method as recited above.

However, Kalender et al. fails to teach adjusting the x-ray current proportional to a square-root of the estimated attenuation of radiation.

Gies et al. teaches adjusting an x-ray current proportional to a square-root of an estimated attenuation of radiation (pg. 2235, col. 2, second paragraph; pg. 2236, col. 2, last paragraph – pg. 2237, col. 1, first paragraph).

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the method of Kalender et al. to include the feature suggested by Gies et al. since one would have been motivated to make such a modification to provide tube current control which yields the optimal pixel noise level for a given total dose (pg. 2237, col. 1, last paragraph – pg. 2237, col. 2, line 1) as implied by Gies et al.

Regarding claim 20, Kalender et al. teaches a method as recited above. Kalender et al. further teaches that the radiation source includes an x-ray tube (pg. 2248, col. 1, line 7), and the means for adjusting a level of radiation adjusts an x-ray current of the x-ray tube (pg. 2248, col. 1, lines 13-15).

However, Kalender et al. fails to teach adjusting the x-ray current proportional to a square-root of the estimated attenuation of radiation.

Gies et al. teaches adjusting an x-ray current proportional to a square-root of an estimated attenuation of radiation (pg. 2235, col. 2, second paragraph; pg. 2236, col. 2, last paragraph – pg. 2237, col. 1, first paragraph).

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the method of Kalender et al. to include the feature suggested by Gies et al. since one would have been motivated to make such a modification to provide tube current control which yields the optimal pixel noise level for a given total dose (pg. 2237, col. 1, last paragraph – pg. 2237, col. 2, line 1) as implied by Gies et al.

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kalender et al. as applied to claim 8 above, and further in view of Popescu et al. (US 5867555).

Regarding claim 16, Kalender et al. teaches a method as recited above.

However, Kalender et al. fails to teach estimating a baseline modulation attenuation based on an average attenuation of transmission tomographic imaging data spanning an integer multiple of a revolution of the radiation source.

Popescu et al. teaches estimating a baseline modulation attenuation ("modulation index", col. 3, line 67 – col. 4, line 1) based on an average attenuation of transmission tomographic imaging data (col. 3, lines 64-65; col. 4, lines 11-12) spanning an integer multiple of a revolution of the radiation source (col. 3, lines 58-62).

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the method of Kalender et al. to include the feature of Popescu et al. since one would have been motivated to make such a modification to provide a method which allows for a faster calculation of the attenuation during a scan (col. 2, lines 38-40) as implied by Popescu et al.

Allowable Subject Matter

7. Claims 13-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 13, the prior art fails to teach or fairly suggests a method requiring the step of estimating a constant of proportionality between the x-ray current and the estimated

attenuation of radiation raised to the selected power based on the transmission tomographic imaging data acquired in the initial revolution and adjusting the x-ray current by multiplying the constant of the proportionality and the estimated attenuation of radiation raised to the selected power for each upcoming position or angular bin, in combination with all the other limitations of the claim.

Regarding claim 14, the prior art fails to teach or fairly suggests a method requiring the step of determining a baseline current component based on a ratio of an estimated baseline attenuation of an upcoming position or angular bin and an average attenuation of the initial revolution, determining an axial current component based on a ratio of an estimated axial attenuation of the upcoming position or angular bin and a maximum or average attenuation of a present revolution, and determining a total x-ray current by combining the baseline and axial x-ray current components, in combination with all the other limitations of the claim.

Claim 15 contains allowable subject matter by virtue of its dependencies.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MONA M. SANEI whose telephone number is (571)272-8657. The examiner can normally be reached on M-W 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mona M Sanei/
Examiner, Art Unit 2882

/Edward J Glick/
Supervisory Patent Examiner, Art Unit 2882